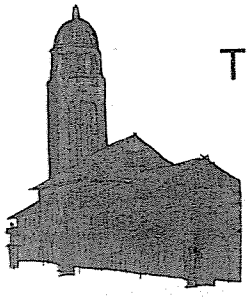

The John A. Blume Earthquake Engineering Center

Department of Civil Engineering • Stanford University, Stanford, California 94305

(415) 497-4150, 497-4128, 497-4121

Mr. David J. Leeds
David J. Leeds & Associates
11972 Chalon Road
Los Angeles, CA 90049

Subject: Algerian Building Regulations

Dear Mr. Leeds:

The EERI membership may be interested in a specific example of post-earthquake follow-through action with respect to the El Asnam earthquake of October 1980. During the early part of last month (April) I had the opportunity of working in Algeria with the Organisme de Contrôle Technique de la Construction (CTC); for the purpose of formulating a National Seismic Resistant Building Regulation. The Ministry of Construction plans to have this regulation in effect by June 1981. It will apply to not only the reconstruction activity in El Asnam, but to all other seismic regions of Algeria. While this code writing effort began in 1976 through a technical assistance agreement with the Blume Center at Stanford, it was given a very high priority after the El Asnam event. If Algeria, through the efforts of CTC, can achieve a workable seismic code by June, then it will be a most worthy complement to the excellent post-earthquake rescue and care effort by that government in El Asnam.

The new seismic resistant design regulations will follow a base shear format as proposed by Stanford in 1976,

$$V = ADBQW$$

(interesting to note that the re-arranged coefficients ABDQ provide a fairly good abbreviation for Abdul Qadar, the legendary nineteenth century hero of the Algerian people)

A is the effective zero period acceleration for the four seismic zones.

D is the spectral shape or DAF for the two general site soil conditions.

B is the structural system reduction factor like 1/R in the ATC-3 document.

Q is a structural quality factor that increases significantly when the structural system lacks redundancy or has irregular or non-symmetric features.

The resulting seismic design load levels in the El Asnam region are about 3/4 to full UBC Zone 4 values, depending on the Q factor for the structure. In the coastal regions containing the population centers such as Algiers, Oran, and Constantine, loads are at about 1/2 UBC Zone 4.

The Algerian regulations will contain most of the basic items found in the SEAOC Recommendations (1980 Blue Book), however some modifications were necessary to meet the prevailing structural design methodology, and the type and quality of construction.

Designers in Algeria use French Normes for Reinforced Concrete which are straight-line stress theory and working stress design. Details necessary for ductile containment of frame and wall elements had to be specified explicitly, since any reference to strength capacity, or ultimate strain, or yield hinges, are not in the average designer's terminology.

Rather than calling for high seismic load values, these were kept at a moderate level, and restrictions were placed on the allowable types of concrete construction. With the experience that saw failure of the short column foundation supports (vide sanitaire) and the lethal behavior of the very common thin column and thick beam frames both with and without brittle tile infill material; the structures of El Asnam will be as follows: No "ductile frames", since design practice, material quality, and construction methods just cannot provide the required performance. All concrete frame systems must be braced by continuous 100 percent seismic load resisting shear walls; confined edge members are necessary for important walls. The "vide sanitaire" has been replaced by continuous perimeter walls with access openings.

In the other seismic regions, concrete frames (without shear walls) are permitted, but must contain continuous steel, stirrups, joint ties, and must have the relative beam-column sizes to provide reasonable ductile performance. For the common case of tile or block infill, the frames must have extra stiffness and shear resistance to control damage due to interaction with the infilled panels.

The directors and technical staff of the CTC are well able to provide this design document and we wish them all the luck and energy to assure its early implementation.

Further information can be obtained from the John A. Blume Earthquake Engineering Center at Stanford.

Sincerely,

Ted Zsutty

Ted Zsutty
Consulting Professor

TZ/jb

cc: Roger Scholl